New Dual PCIe Telemetry Decom Processing Cardset
Model 1632AP

Features:

- Dual Stream Third Generation 0-72 Mbps PCIe, Half Length “all-in-one” PCM Decom Processor
- State-of-the-art modular Bit Sync, CH 4 Class 2 Decom, IRIG Time & Sim in a single PCIe card
- Compliance with IRIG 106 Chpt 4 (class 1 & 2), CVSD, Chpt 8, Chpt 9, Chpt 10 & CCSDS in streaming, burst, & packetized forms
- DOD STIG compliant OS agnostic card embedded dynamic “soft-decom” processors
- Supports multi-card PCIe, 1 to 8 stream system configurations
- Upgraded companion Model 1615AP PDSP 6MD/sec EU processor module
- Decom card embedded “data-driven” deterministic decommutation and output data formatting - display, recording, & playback
- Acroamatics GUI Telemetry System Software (ATSS) included - Lifetime Support included - no charge!
- Native support for 3rd party display, analysis, and instrumentation support software such as IADS, DeweSoft & ILIAD
- IRIG Ch 10 format file export & import 0-72 Mbps Programmable PCM Simulator & Stream Reconstructor
- NASA CCSDS & packet TMoIP & DQE encoded stream compatible decom & system EU processing

General Description

The new Dual Channel PCIe Model 1632AP multi-function telemetry data processing module features the fastest end-to-end decom processing speeds in the industry - yet supports data format and mission project set-up interchange with existing Acroamatics PCI TDP products and systems. Utilizing the latest in FPGA component technology, the new Model 1632AP dual channel telemetry processing card provides increased decom & stream processing rates while consuming less power (1/3 that of the preceding generation) and delivering improved functionality.

The 1632AP employs real-time, deterministic card embedded stored program processing technology, supporting real-time decommutation of multiple software program driven sub, super, and asynchronous embedded framed TM streams – with support for dynamic conditional format switching and user defined conditional data product generation in its multiple onboard memory stored program locations. Once loaded and initialized, the new 1632AP PCIe decom operates wholly independent of its host Windows chassis administrative OS and is designed to employ standard Windows services to independently record data to disk, directly drive local quick-look display processes, and deterministically support directly coupled networked data services connections - making it the most effective standalone all-in-one card level telemetry processing device on the market today.

As part of an integrated multi-card / low latency real time telemetry processing system, up to four independent 1632AP cards are able to be joined together (via dedicated 64-bit I- Bus) with our powerful Model 1615AP EU processing card using provided ATSS system software.
Bit Synchronizer

Model 474DM (Option - companion mezzanine module to Model 1632AP)

**PCM Signal Inputs**

- **Source**: Two each analog baseband user selectable PCM inputs - #1 single ended, #2 RS-422
- **Isolation**: Greater than 60dB at 20MHz
- **Impedance**: Program selectable: Hi-Z/Lo-Z. Single Ended: 4kΩ/75Ω, Differential: 10kΩ/150Ω
- **Signal Level**: Single Ended: 0.2-20V P-P, Differential: 0.2-10V P-P
- **DC Offset**: 20V max Hi-Z
- **PCM Codes**: Program selectable: NRZ-L/M/S, Biø-L/M/S, DBiø-M/S, DM-M/S, MDM-M/S, RZ
- **Derandomizer**: Program selectable: RNRZ 9/11/15/17/23, forward/reverse

**Synchronization**

- **Bit Rate Range**: 8bps - 72 Mbps NRZL, 8 bps - 44 Mbps Biø Codes
- **Capture Range**: 3 times the programmed loopwidth, typical
- **Loop Bandwidth**: 0.1% to 3.2%, program selectable in 0.1% increments
- **Sync Threshold**: 0dB for NRZ-L and Biø-L codes
- **Sync Maintenance**: (LW=0.1%) –2dB NRZ-L and Biø-L codes
- **Sync Acquisition**: (LW=1.6%, SNR > 12dB) Typically less than 32 bit periods
- **Sync Retention**: (LW=0.1%, SNR > 3dB) Retains sync through > 1028 + consecutive dropouts, all modes
- **Sync Error Rate**: (LW=0.1%) to within 0.25 to 0.50 dB of ideal bit error rate performance curves, absolute (not average) in all modes

**Real Time PCM Frame Sync/Decommutator**

Model 1632AP Card Embedded Dual Channel Low Latency Frame Sync, Decom, and Output Data Formatter

**PCM Input**

- **PCM Input Sources**: To four program selectable clk/data inputs supported for each decom channel. TTL NRZ-L Data and 0º Clock.
- **Impedance**: 50 Ohm input impedance, TTL compatible.
- **Bit Rate**: From 0 to 72 Mbps, burst, jam, and streaming mode compatible
- **Polarity**: Programmable, automatic polarity correction.
- **Word Length**: Programmable, 1 to 32 bit word length for each input.
- **Word Orientation**: Programmable, MSB/LSB orientation for each input word.
- **Parity**: Selectable leading, trailing, or no parity checking for each word.

**Synchronization**

- **Mainframe Sync**: Provides for programmable sync pattern and mask, complement pattern recognition, and variable length frame decommutation. The pattern may be up to 64 bits in length.
- **Subframe Sync**: Six independent synchronizers (per decom channel) are capable of decommutating sub-frames within subframes. Subframes synchronize to fixed recycle patterns, complement frame sync patterns, and various ID patterns.
- **ID Sync**: Both recycle and ID patterns may be assembled from multiple word locations. Recycle patterns may be up to 32 bits long. Two types of ID synchronization are supported: JAM patterns of arbitrary values, and incrementing or decrementing frame counters with limit checking. ID sync words may be up to 16 bits in length.
- **Sync Strategy**: Programmable Search-Check-Lock sync strategy, bit error tolerance, and bit slip window provide reliable frame synchronization.
- **Asynchronous Formats**: Subframe synchronizer may be programmed to decommutate embedded formats having unique frame sync patterns and format structures.
- **Format Switching**: 16 testable flags store the results of select input stream bit and word comparisons to control real-time format switching. Frame Sync / Decom format switching is loss-less and immediate. Multiple card resident micro-coded decom processing programs are stored in local decom memory in support of such conditional format switching events.

**Outputs**

- **Standalone Data Output**: Data is available to the host computers PCI bus as memory-mapped frame buffers, Current Value Table (CVT), or as a data stream selectively transferred by PCI bus DMA independently from each decom channel. Data is 32 bits with programmable MSB/LSB output word justification, sign extension, or zero insertion for LSB output. Acroamatics Telemetry System Software (ATSS) suite provides a host of Windows compatible (XP and Windows 7 compatible) which support user decom set-up, mission set-up management, and a host of real-time data display, alarming, recording, discrete/analog, and networking data I/O processes and local operator status display, and remote system management and data operations support.
- **I-Buss Data Output**: When used in a system configured with additional 1632AP and PCI 1615AP PDSP EU & Distribution card, the messages containing thirty two bits of data, twelve bits of fine time (microseconds), two bits of status, and 17 bits of data identification. I-bus data can be formatted in either MSB or LSB justified form. LS-justified data can also be sign extended. I-bus timing and decom data is shared in real-time with other I-bus connected cards to insure deterministic time coherent extended decom and EU processing. The 1615AP PCI module is capable of merging data from any of up to four 1632AP cards in a system to support single file merged “raw” and EU multi-stream data recording and formatted data distribution of data from up to 8 high rate TM streams, supporting display and networking data communications processes. Decom and bit sync data quality status words are shared for downstream data validation and real-time TDP system status reporting.
- **2 Serial PCM Outputs**: Two programmably controlled serial outputs, one per Model 1632AP PCM decom channel.
### Dual PCM Simulator/Encoder

**Model 1632AP Card Embedded User Programmable 1 bps - 72 Mbps PCM Simulator/Encoder**

#### PCM Programmable PCM Format Simulator/Encoder Functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format Storage</td>
<td>Each PCM Simulator stores two complete, selectable PCM formats. Performs asynchronous frame insertion and format switching</td>
</tr>
<tr>
<td>Subframe Capability</td>
<td>Generates up to three subframes within mainframe. Generates subframe within subframe</td>
</tr>
<tr>
<td>Frame Length</td>
<td>Each PCM simulator supporting programming and generation of formats of up to 65,536 words for the mainframe and 16,384 per subframe</td>
</tr>
<tr>
<td>Data Sources</td>
<td>1M unique user programmable fixed value word registers, and 64 K unique dynamic function word registers, with two 16-bit module up/down counters, two 16-bit external inputs, one 16-bit pseudo-random number generator, and one 16-bit program counter are provided for use with each of two complete user-defined onboard stream simulation memories, for each of two PCM simulators in a dual stream Model 1632AP card.</td>
</tr>
<tr>
<td>Word Length</td>
<td>Programmable for each data source: static data words 1 to 32 bits; all others 1 to 16 bits</td>
</tr>
<tr>
<td>Word Orientation</td>
<td>Program selectable: MSB/LSB for each data word</td>
</tr>
<tr>
<td>Parity Generation</td>
<td>Program selectable: leading, trailing, or no parity for each data word</td>
</tr>
<tr>
<td>Dynamic Data Memories</td>
<td>2 unique, user-defined RAM’s. Presettable to ramp, sine, triangle and squarewave functions or user-defined input functions. Selectable data type: 1’s complement, 2’s complement, signed magnitude, offset binary. Programmable time base.</td>
</tr>
</tbody>
</table>

#### PCM Outputs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Rate</td>
<td>Program selectable: 1 bps to 72 Mbps, tunable to 0.1% of programmed rate</td>
</tr>
<tr>
<td>Clock</td>
<td>0º clock</td>
</tr>
<tr>
<td>Data</td>
<td>NRZ-L</td>
</tr>
<tr>
<td>PCM Output</td>
<td>TTL compatible NRZ-L data and 0º clock</td>
</tr>
</tbody>
</table>

#### IRIG Time Code Reader/Generator

**Integrated IRIG Time Code/Reader/Generator/Translator, one per Model 1632AP card. Shared in multi-card system applications via “I-bus” card interconnect**

#### IRIG Time Code Reader/Generator/Translator

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>0.5 to 20 Vpp, Single-ended</td>
</tr>
<tr>
<td>Impedance</td>
<td>12K Ohms minimum</td>
</tr>
<tr>
<td>Input Codes</td>
<td>Translates IRIG G, A, B, &amp; NASA-36</td>
</tr>
<tr>
<td>Input Frequency</td>
<td>125 Hz to 400,000 Hz</td>
</tr>
<tr>
<td>Modulation Index</td>
<td>2:1 through 5:1.</td>
</tr>
<tr>
<td>Polarity</td>
<td>Program selectable, Invert or Normal Polarity</td>
</tr>
<tr>
<td>Internal Time</td>
<td>Time Base 40MHz crystal oscillator</td>
</tr>
</tbody>
</table>

#### Operational

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate Mode</td>
<td>Time is generated from the onboard crystal oscillator and is pre-settable from the Host.</td>
</tr>
<tr>
<td>Translate Mode</td>
<td>Time is read from an external source.</td>
</tr>
<tr>
<td>Translate Carrier Mode</td>
<td>The internal timing is based on the input carrier.</td>
</tr>
<tr>
<td></td>
<td>This mode enables the system to translate time as the input carrier rate varies during playback of an analog recording</td>
</tr>
<tr>
<td>Translate Failsafe Mode</td>
<td>The internal timing is phase-locked to the input carrier. In the event of time dropout, the translator continues generating time without interrupt.</td>
</tr>
<tr>
<td>Frame Bypass</td>
<td>Automatic frame bypass compares previous time frame with current one, and Time Accumulator updates when they agree</td>
</tr>
</tbody>
</table>

*Subject to change without notice.*
System Software

Acroamatics Telemetry System Software (ATSS)

Setup, Operations, Data Services, Display and Analysis, and Remote Operations Support


Standards Compliant: IRIG Chapter 4, 5, 7, 8, 9 and 10 compatible TMATS Import, NASA CCSDS, CVSD, integral IADS Data Services, LabVIEWS and Matlab.

Data Display Types: Scalable multi display/page, 32 pages - Horizontal and vertical strip chart, tabular, bargraph, annunciator, controls / meters, each with dynamic limit checking, alarming, scalable, parameter and E/U annotation.

Data Recording: The ATSS Data Recording Client provides local operator control of the 4022 CTS record function, and can operate as a standalone application or in conjunction with ATSS software managed real-time telemetry processing operations.

Networking: The Model 1632AP supports both networked system set-up and operation admin and real-time data communications. ATSS Remote operations software ($225 option) provides remote users all functions offered to the local user, including data recording, data display, system status and set-up GUI applications.

Options

Tunable Bit Synchronizer: The Model 474DM 8 Hz to 72 Mbps Advanced PCM Bit Sync Mezzanine Module may be ordered with or added to the 1632AP.

DeweSoft Client: Provides an affordable integrated standalone (independent of core Acroamatics software/hardware)

Display/Analysis: Windows application software driven local or networked real-time and post mission display, analysis, and independent select data logger toolkit

Physical

Format: Standard PCIe X1 format, Half Length

Cooling Requirements: 30 Linear FPM

Power Requirements: +3.3VDC at < 1.0 Amp + 12 VDC at 0.10 Amps, (opt. mezzanine bit sync, TMoIP, PDSP modules not incl.)

Dimensions: 4.20” (10.67cm) H x 6.9” (17.53cm) W x .55” (1.4cm) D

Temperature: Operating: 0º to +40º C, Non-Operating: -40º to +86º C

Relative Humidity: Up to 90% non-condensing


Vibration Operating: 0.5G, 5 to 2000Hz, Non-Operating: 1.2G, 5 to 500Hz